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ABSTRACT

This study examined the effect of using an outdoor nature investigation program on the ability of third-grade students to transfer knowledge. Specifically, the study determined whether the program enhanced students' ability to transfer declarative (facts and concepts), procedural (process skills), and schematic (experience) knowledge to a set of transfer situations. Forty-five third-grade students from an urban elementary school were divided into 2 groups, both of which were taught science by the same teacher in consecutive 7-week units. The main theme of each unit was habitats. The treatment program, used only with the second student group, involved students becoming scientists by reading about a particular topic, posing questions, collecting data in their schoolyard, and analyzing the data by creating graphs and charts. Students were interviewed after watching video vignettes that presented situations requiring generalization from what they had learned during the unit. Results indicate that both groups effectively transferred knowledge to the more similar scenario, but only the group that received the treatment was able to transfer knowledge to the less similar scenario. In addition, the treatment group transferred declarative knowledge better than students in the control group on the more similar problem but not on the less similar problem. The treatment group appeared to transfer procedural knowledge better in both scenarios. Transfer of schematic knowledge appeared to favor the treatment group, but schematic knowledge was low in both groups. Contains 13 references. (LP)

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"The Effect of an Outdoor Nature Investigation Program on Young Children's Ability to Transfer Knowledge"

Paper presented at the
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"The Effect of an Outdoor Nature Investigation Program
on Young Children's Ability to Transfer Knowledge"

"Effective education depends on curricula with an eye for transfer" (Singley & Anderson, 1989, p.1). Trends for determining effective education need to go beyond achievement. Emphasis in education should be towards teaching for insight or a deeper understanding. Dewey (1916) wanted education to emphasize knowledge with rich ramifications in the lives of learners; knowledge worth understanding. The power of the human cognitive system is going beyond the information given.

Perkins (1991) proposed that "the artful teacher creates the expectation in students that there are connections to be made--connections with upcoming ideas in the same course, with ideas in other courses, and with out-of-school settings" (p. 7). Therefore, the goal of education needs to be to prepare students to use relevant knowledge to solve important problems (Gragg, 1940; Bransford, Franks, Vye, & Sherwood, 1989).

What knowledge transfers and how educators can best promote transfer remains questionable (Perkins & Salomon, 1987; Singley & Anderson, 1989). Studies have included samples of toddlers, adolescents, and adults (Judd, 1908; Gick & Holyoak, 1980; Brown & Kane, 1988; Brown, 1990). The culmination of such efforts still leads to questions such as: what types of knowledge transfer, how does knowledge transfer, what types of curriculum and instruction are needed to enhance transfer, and at what age can educators expect different kinds of transfer.

The purpose of this study was to examine one particular program to determine whether it enhanced third grade students' ability to transfer declarative (facts and concepts), procedural (process skills), and schematic (experience) knowledge to a set of near and far transfer situations. In other words, situations that become more distant from the first in terms of content and context.

The research question was: What is the effect of using an outdoor nature investigation program, on the knowledge transferred by third grade students? The hypotheses were:

1. There is a statistically significant difference between the knowledge transferred by third grade students who participate in the investigations and third grade students who do not participate in the investigations given a near transfer situation.
2. There is a statistically significant difference between the knowledge transferred by third grade students who participate in the investigations and third grade students who do not participate in the investigations given a far transfer situation.
3. There is a statistically significant relationship between third grade students' knowledge given a near transfer situation and those third grade students' knowledge given a far transfer situation.

Forty-five third grade students (two groups) in a urban elementary school were used for this study. Both groups were taught science by the same teacher in consecutive seven-week units. The main theme of each unit was "Habitats". The treatment program was used with the second group of students only.

The treatment was a program entitled, Nature At Your Doorstep (Basile, Collins, & Malone, 1997). This is a skill-based curriculum rooted in the scientific method. In

each investigation, primary school students become scientists (that is, a botanist, entomologist, or wildlife biologist), by reading about the particular topic provided, posing questions, collecting data in their schoolyard, and analyzing the data by creating graphs and charts. It presents knowledge in a contextual format that connects curriculum to practical applications and personal insights.

Data was collected using the following methodology. Students saw a video vignette, in which three children are confronted with the problem of what to do with a baby bird that they found on the ground in their local park. After watching this segment of the tape, students were individually interviewed utilizing questions that would provide the researcher with evidence of declarative, procedural, and schematic knowledge.

In week seven, students saw a second video vignette. This video vignette was a continuation of the first. However, the children have now met an animal rescue worker who has a bald eagle to be released. The children in the video are now confronted with the problem of finding a good habitat for this bald eagle. This video problem represented the same content area as the first video, habitats, and was similar in context, birds. This would be considered a near transfer situation. Students watched this segment of the tape and were asked a series of questions similar to the first set of questions.

Two weeks passed without additional information regarding habitats or Nature at Your Doorstep. In week ten, students viewed a third video vignette and were asked to solve the following problem. On this tape an astronaut discusses the space station and the fact that at some point in time NASA may want to take children to space. The problem presented to the students was that NASA did not know how to create the proper habitat for third grade students. This video problem represented the same content area as the first video, habitats, but contained a different context, people. This would be considered a far transfer situation. Again students were interviewed individually and asked similar questions as previous sessions. Data collected were analyzed using a multivariate analysis of covariance and Pearson product moment correlation procedures.

Results for hypothesis one and two are summarized in the figure below:

	Posttest 1: Near Transfer	Posttest 2: Far Transfer
Overall results	Not Statistically Significant Not Educationally Significant	Statistically Significant* Educationally Significant**
Declarative Knowledge	Statistically Significant* Educationally Significant**	Not Statistically Significant Not Educationally Significant
Procedural Knowledge	Not Statistically Significant Educationally Significant**	Statistically Significant* Educationally Significant**
Schematic Knowledge	Not Statistically Significant Not Educationally Significant	Statistically Significant* Educationally Significant**

* $p < .05$; Treatment > Non-Treatment
** $p > .50$; Treatment > Non-Treatment

Overall results indicated that there was a statistically significant difference between the two groups given a far transfer situation not a near transfer situation. Both groups, independent of the treatment, transferred knowledge to the near transfer situation, but only the group that received the treatment was able to transfer knowledge to the far transfer situation. Therefore, the treatment appears to be effective in aiding transfer of all three knowledges. In order to examine this conclusion further each knowledge component was considered separately.

When declarative knowledge was analyzed, the researcher found that the treatment group transferred declarative knowledge better than students in the control group on the near transfer problem but not the far transfer problem. Students in the control group learned about habitats through traditional instruction, such as whole group learning, focus on factual knowledge and comprehension, and low-level questioning strategies.

Research has shown that transfer depends on the type of instruction and the way the knowledge is organized (Singley & Anderson, 1989). Therefore, students in the treatment group used the outdoors as their classroom and learned declarative knowledge as a part of the process of systematically investigating habitats. Cognitive scientists continue to debate whether the two can be separated (Singley & Anderson, 1989) or whether there is a concrete interactional effect. Differences between the groups with regard to the second problem could be attributed to the fact that the first group was the teachers homeroom group, continually exposed to materials in the classroom pertaining to the content area.

The treatment group not only appeared to transfer procedural knowledge better in the near transfer situation but also the far transfer situation. These results are the most promising and possibly the most telling about what can occur with the type of instruction used in this study. Royer (1986) conveys that something is understood when it has been integrated in a meaningful way into the learner's existing knowledge structure. "When the learner does not have any relevant knowledge that can be used to construct an interpretation of a message, memorization may occur, but understanding will not" (p. 87). In addition, "the ability to transfer learned information is evidence that understanding is present" (p. 95).

Transfer of schematic knowledge appears to favor the treatment group. However, low mean scores from both groups showed that schematic knowledge seemed to be lacking. The conclusion is that seven weeks is not be enough time for these activities to become as meaningful as possible.

Finally, logic seemed to imply that there would be a relationship between students who could transfer to the near transfer situation and students who could transfer to the far transfer situation. The lack of statistically significant results for this third hypothesis implies that many factors were at work, that transfer is not simple or predictable.

The implications of this study guide not only the program in question, but also curriculum and instruction in general. This particular program has the potential to improve transfer abilities, especially in the area of procedural knowledge. However, as

the program develops, there is also need for the inclusion of opportunities for providing more practice transferring skills learned to new situations. Students need to be provided with opportunities to use the knowledges they have learned to solve authentic problems.

Generally, continued emphasis needs to be placed on instruction that integrates declarative and procedural knowledge as this may lead to greater transfer in problem solving tasks. Novices must be helped to notice the important features of various situations. Educators can influence the way students think and solve problems especially when both instructional and organizational factors focus on the goal of transfer. Therefore their primary role is to understand the goals of instruction. They need to know what knowledge they wish to impart and what kind of transfer they want their students to acquire (Royer, 1986).

Changes need to be made in school structures, in-service programs, preservice education, instruction and assessment. Students need to have success in both achieving knowledge and skills and transferring them. Stephens (1963) states, "just as students learn to learn, so may they have some success in learning to transfer" (p. 118).

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